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Solution by the PROPOSER.

Using a figure similar to the one used in problem 116, let $AOD=\theta_1$, $BOD=\theta_2$, $COD=\theta_3$, etc. Let p be the required chance, p_1, the chance that it does not contain the center of the circle.

$$p_1=\frac{2\int_0^{\frac{1}{2}\pi}\int_0^{\theta_1}\int_0^{\theta_2}\ldots\int_0^{\theta_{n-2}}d\theta_1 d\theta_2 d\theta_3\ldots d\theta_{n-1}}{\int_0^{\pi}\int_0^{\theta_1}\int_0^{\theta_2}\ldots\int_0^{\theta_{n-2}}d\theta_1 d\theta_2 d\theta_3\ldots d\theta_{n-1}}=\frac{(n-1)!}{\pi^{n-1}}.\frac{2(\frac{1}{2}\pi)^{n-1}}{(n-1)!}=\frac{1}{2^{n-2}}.$$

$$p=1-p_1=1-(1/2^{n-2}).$$

Also solved with the same result by *J. SCHEFFER*.

MISCELLANEOUS.

133. Proposed by HARRY S. VANDIVER, Bala. Pa.

If a group G of order mn has a subgroup H of order n, and if n has no prime factor which is less than m, show that H must be a self-conjugate subgroup. (Frobenius.)

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Let the substitution of the given subgroup (H) be 1, t_2, t_3, ...t_p.

If H is not self-conjugate, multiply it into any substition (S) which is not commutative to it. If the transform (H_1) of (H) with respect to any one of these products contains a substitution ($s^{-1}ts$) of order m^{β} ($\beta>0$) which is not found in H and if t does not transform H_1 into itself we can form the following rectangle with m conjugate rows of p elements:

$$\begin{array}{llll} s, & st_2, & st_3, & \ldots\ldots st_p \\ ts, & tst_2, & tst_3, & \ldots\ldots tst_p \\ st^2, & t_2st^2, & t_3st^2, & \ldots\ldots t_pst^2 \\ \ldots\ldots & \ldots\ldots & \ldots\ldots & \\ st^{m-1}, & t_2st^{m-1}, & t_3st^{m-1}, & \ldots\ldots t_pst^{m-1}. \end{array}$$

All the substitutions of a given row transform H into the same group, while any two substitutions from different rows transform H into two different groups. As no substitutions in the given rectangle can be equal to each other, the entire group would have to contain at least $p(m+1)$ substitutions. This is contrary to the hypothesis. Therefore H is a self-conjugate sub-group.

134. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

Give a complete solution of the Jacobian equation $\kappa^2\text{sn}^4u+2\kappa^2\text{sn}^2u+1=0$.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Let $\mathrm{sn}u=x$. $\therefore x^4+2x^2+1/\kappa^2=\theta$, where κ is the modulus.

$\therefore (x^2+1)^2=-(1-\kappa^2)/\kappa^2$.

$\therefore x=\pm\sqrt{\dfrac{-\kappa\pm\sqrt{(-1)}\sqrt{(1-\kappa^2)}}{\kappa}}=\pm n$, suppose. $\therefore \mathrm{sn}u=\pm n$.

$$\therefore u=2\int_0^n \frac{dx}{\sqrt{[(1-x^2)(1-\kappa^2x^2)]}}=2F(\kappa,\, n)$$

$$=2[n+\tfrac{1}{6}n^3(1+\kappa^2)+\tfrac{1}{40}n^5(3+2\kappa^2+3\kappa^4)+.....].$$

When $\kappa=1$, $u=2\sqrt{-1}(1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+.....)$, since $n=\pm\sqrt{-1}$).

$\therefore u=\frac{1}{2}\pi\sqrt{-1}$.

But $u=2\displaystyle\int_0^{\sqrt{-1}}\frac{dx}{1-x^2}=\log\left(\frac{1+\sqrt{-1}}{1-\sqrt{-1}}\right)$.

$\therefore \pi=2\sqrt{-1}\log\left(\dfrac{1-\sqrt{-1}}{1+\sqrt{-1}}\right)$, a result previously referred to in this journal.

PROBLEMS FOR SOLUTION.

ARITHMETIC.

167. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

A traveler notices that $m=2\frac{1}{2}$ times the number of spaces between the telegraph poles that he passes in a minute is the rate of train in miles per hour. How far apart are the poles ?

168. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

If I buy for $m=10\%$ and $n=5\%$ *less* I shall gain $p=15\%$ and $q=5\%$ *more*. What is my rate of gain ?

ALGEBRA.

178. Proposed by W. J. GREENSTREET, M. A., Editor of The Mathematical Gazette, Stroud, England.

A_n being the arithmetic mean of the nth powers of the numbers less than p and prime to it, find a relation between A_3, A_2 and p.

179. Proposed by DR. L. E. DICKSON, The University of Chicago.

Find the roots of the algebraically solvable quintic equation

$$x^5+qx^2+px+\tfrac{1}{5}\left(\frac{q^2}{p}-\frac{p^3}{5q}\right)=0.$$